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Description

The present invention relates to power systems in general and in particular to a power system that includes a voltage sensitive switching circuit.

Most electrical equipment is powered from a power supply connected to main power lines. This equipment is subjected to intermittent loss of power caused by someone unplugging the power supply cord from the power outlet or during service interruption or power outages. There are several types of electrical equipment and appliances which require continuous power.

An acceptable way of providing continuous power is to include a battery in the power supply system. The battery is charged when the main power is operational. However, in the event of a power outage, the power is supplied from the battery. When a battery is used as a stand-by power source, one has to ensure that the battery is not deep discharged (i.e., discharged below a predetermined voltage level). If one deep discharges a battery, the life of the battery is greatly reduced.

It is known in the prior art to connect the battery via a switching mechanism to a load. In the event the battery is discharged to a predetermined voltage level, the switching mechanism is activated to disconnect the load and prevent the battery from deep discharging. Prior art examples of stand-by power supplies with switching mechanisms which disconnect the battery are set forth in USP 4,704,542, JP55-76578(A), Appl. No. 53-150695 entitled "Over Discharge Preventing Circuit for Battery" to Anritsu Denki et al and German patent DT 2732-794. Still other prior art circuits and techniques use a positive feedback resistor connected between the load and a trigger transistor to connect/disconnect the battery.

Even though the prior art circuits work well for their intended purposes, they do not switch instantaneously. As a result, even after switching, the battery still continues to discharge through circuitry load. The continued discharge below the threshold voltage level tends to damage and reduce the life of the battery. Also, the period of indecision occurring between activating of the switching circuit and when it finally switches, causes electrical noise in the load. There are certain types of load (e.g., computer systems) which are very sensitive to electrical voltage noise. Because of the noise, the prior art switching systems are not well suited for noise sensitive loads.

It is a general object of the present invention to provide a more efficient auxiliary power system than has heretofore been possible.

It is another object of the present invention to provide a voltage sensitive switch that disconnects the auxiliary power system from its load instantaneously.

The above and other objects are achieved by an auxiliary power system including a battery whose output node is coupled to a battery charge circuit and a deep discharge prevention circuit. The deep discharge prevention circuit includes a large gain hysteresis circuit that forces an FET device to switch instantaneously once a preset turn-on/turn-off voltage level is reached. The battery charge circuit includes a series pass transistor with a feedback loop that maintains a constant voltage drop across the transistor and, as such, minimizes the power consumption in the series pass transistor.

More particularly, the deep discharge prevention circuit (15) is a voltage sensitive switch which includes an FET device with its source terminal coupled to the battery. A circuit arrangement (CR1, R6) which sets the turn-on voltage level, interconnects the source terminal to the base of transmitter (Q4) whose emitter is returned to ground potential. A circuit arrangement (CR2, R8) which sets the turn-off voltage level, interconnects the drain terminal of Q5 to the base of Q4. A circuit arrangement R4 assures that Q5 (a p-channel FET) is turned off when Q4 is off. The zenner voltage ofCR1 is chosen higher than that of CR2, and it is chosen also such that when the battery voltage reaches proper potential, CR1 starts conduction. This, in turn, turns on Q4 which, in turn, turns on Q1. With Q5 on, CR2 turns on and latches Q4 on. As the battery voltage drops due to discharge, CR1 turns off, but CR2 remains on until the battery voltage approaches the deep discharge level, then CR2 turns off, which causes Q4 to turn off, which causes Q1 to turn off, which causes CR2 to latch off.

Likewise, the battery charger circuit receives a rectified, step-down DC voltage which is generated from an AC power supply main. The output of the battery charger circuit is coupled by a series pass transistor device whose emitter electrode is coupled to the positive terminal of the battery. A feedback loop including an active device interconnects the positive terminal of the battery to the collector terminal of the transistor. Thus, as the voltage at the positive terminal of the battery charges the voltage on the emitter electrode also increases and the voltage on the collector electrode follows suit. Because the voltage on the collector electrode of the transistor is adjusted for changes on the emitter electrodes, power dissipation across the transistor is reduced.

The foregoing features and advantages will now be more fully described with reference to the accompanying drawings.

Figure 1 shows a schematic of an improved power system.

Figure 2 shows a circuit schematic of an improved step-down and battery charging circuit arrangement.

Figure 3 shows a circuit schematic of the deep discharge prevention circuit.

Figure 1 shows an improved power system that provides energy to a load 10. Preferably, the load is

one that requires low voltage such as a computer system or the like. The IBM 4683 Point-of-Sale System is an example of a low voltage load that could be coupled to the power system. The IBM 4683 Point-of-Sale system is a computer system that is used in several types of business establishments. The improved power system includes a battery 12 which provides stand-by power in the event that the AC voltage from AC power source 14 is disrupted. Preferably, the battery is a sealed lead acid battery such as Panasonic PN LCL12V24P. Of course, other types of similar batteries could be used without deviating from the scope or spirit of the present invention.

The positive terminal of battery 12 is connected to node N2. Node N2 is connected by deep discharge prevention circuit means 15 to a voltage step-down converter means 16. As stated previously, the battery 12 is subject to damage if discharged below a preset voltage level. The function of the deep discharge prevention circuit means 15 is to disconnect battery 12 from load 10 when the voltage level at node N2 reaches the preset level. The voltage step-down circuit means 16 is a DC-to-DC converter circuit which accepts the voltage from the deep discharge prevention circuit means 15 and generates a voltage whose level is compatible with the requirements of load 10. In case load 10 is a computer system, the output voltage from the voltage step-down converter means 16 is within the range of 5 volts.

Still referring to Figure 1, the improved power system includes a conventional power supply 18 and a battery charging generating means 20. The power supply 18 is connected through a connector plug assembly 22 to AC power source 14. The conventional power supply 18 accepts at its input an AC line voltage and generates a DC voltage on conductor 24. In the preferred embodiment of the invention, the DC voltage on line 24 is within the range of 22-34 volts DC. The conventional power supply 18 comprises a step-down transformer 18' and full wave rectifier means 18". Because the use of a step-down transformer and a full wave rectifier, for generating a desired DC voltage, is well known in the prior art technology, further description of the power supply 18 will not be given.

Still referring to Figure 1, the battery charging generating means 20 includes a voltage step-down converter circuit means 26, battery charge circuit means 28 and battery feedback circuit means 30. The details of each of these components will be given subsequently. Suffice it to say at this point that the voltage step-down converter 26 accepts a DC voltage on conductor 24 and generates a lower voltage which is supplied on conductor 32. In the preferred embodiment of this invention, the voltage on conductor 32 is within the range of from 12-16.3 volts DC. Similarly, the battery charge circuit 28 accepts the voltage on conductor 32 and generates a lower voltage which is outputted on conductor 34. The voltage on conductor 34 is substantially equivalent to the voltage on battery 12. In the preferred embodiment of this invention, the voltage at node N2 is within the range of from 11.4 volts to 14.7 volts DC. Since the voltage at node N2 varies within a relatively wide range, the battery voltage feedback circuit means 30 adjusts the voltage on node N1 relative to a reference voltage (to be described subsequently) in the step-down converter 26. As a result of the battery voltage feedback circuit means 30, the energy dissipation in the battery charger is significantly reduced.

Figure 2 shows a circuit schematic for battery charge circuit means 28. For simplicity, elements which are common to Figure 1 are labeled with the same numeral. It should be noted that the DC supply voltage V_I is a symbolic representation of the DC voltage which is generated on conductor 24 (Fig. 1). The voltage step-down converter 26 is a DC to DC converter. This type of voltage converter is well known in the prior art. Essentially, an output voltage V_o is generated from an input voltage V_I. V_o is inherently less than V_I. The output voltage V_o is generated on capacitor C. The positive plate of capacitor C is tied to node N1. Thus, whatever voltage is on capacitor C is also present at node N1. Node N1 is connected to ground potential through series connected resistors R1 and R2. A transistor Q1 has its emitter connected via coil L to the positive plate of capacitor C and through diode 36 to the negative plate of capacitor C. The collector terminal of transistor Q1 is coupled to the DC voltage V_I and the base terminal of transistor Q1 is coupled through base drive circuit 38 operational amplifiers 40 and 42 to node N3.

Still referring to Figure 2, the battery charge circuit 28 includes series pass device Q3 and base drive circuit means 44. Even though Q3 can be an FET device, in the preferred embodiment of this invention, Q3 is a bi-polar transistor. The emitter electrode of Q3 is connected via conductor 34 to node N2. The collector electrode of Q3 is connected to node N1 and the base electrode of Q3 is connected to base drive circuit means 44. The series pass device Q3 accepts an input voltage on node N1 and provides a regulated output current to node N2. As stated previously, the step-down converter circuit 26 is a DC to DC converter which provides an output voltage V_o which is approximately 16.3 volts on node N1. The battery charger circuit 28 uses the voltage on N1 as its input and it charges the battery which is connected to node N2 to a voltage which varies from say 11.4 volts to 14.7 volts depending upon the charge level of battery 12. At full charge, Q3 charges the battery with a constant current, say of 1.5 amps. The power dissipated in Q3 without and with the battery voltage feedback circuit is as follows:

Power dissipated in Q3 = voltage across Q3 (collector to emitter) × Q3 current is without the bat-

tery voltage feedback circuit 30,

Power dissipated in Q3 = (16.3 - 11.4)v × 1.5A = 7.4 watts with the battery voltage feedback circuit 30,

Power dissipated in Q3 = (16.3 - 14.7)v × 1.5A = 2.4 watt × max

= (12.0 - 11.4)v × 1.5A = 0.9 watts min.

As can be seen from the above equations, the power dissipated in Q3 without the battery voltage feedback circuit 30 is 7.4 watts. This large power dissipation in Q3 is undesirable. Therefore, without the inclusion of battery voltage feedback circuit means 30 (to be described subsequently) Q3 would have to be selected and provided with heat sinks which is able to handle the maximum power 7.4 watts. Moreover, this amount of power dissipation would require an expensive transistor device and sinks and may even require the use of fans, etc., for cooling purposes. The unnecessary expenses and design limitations are averted by the battery voltage feedback circuit means 30 which will now be described.

Referring again to Figure 2, the battery voltage feedback circuit means 30 samples the voltage at node N2 and adjusts the input voltage at N1 accordingly. Thus, the power dissipation across Q3 is significantly reduced and over design of the transistor and related components are avoided. The battery feedback circuit means 30 includes transistor Q2 with its base terminal connected through R5 to ground potential. Similarly, the base electrode of Q2 is coupled by series connected diode 46 and resistor R4 to node N2. The emitter of transistor Q2 is coupled through R3 to node N1. The collector of transistor Q2 is connected to node N3.

In operation, R1 and R2 form a voltage divider such that the voltage across R2 is approximately equal to the reference voltage on the positive input of op amp 42. The control circuit (including op amp 40 with its ramp voltage on the positive terminal and base drive circuit 38) adjusts the duty cycle of transistor Q1 and thus, V_o in an effort to maintain the two inputs of op amp 42 approximately equal. Since the reference voltage on the positive terminal of op amp 42 is constant and R1 and R2 are constant, the output voltage V_o, at node N1, would also remain approximately constant. However, resistors R4 and R5 form a voltage divider of the voltage at node N2 to that at the base of Q2. As the voltage at node N2 increases due to the battery 12, the voltage at Q2 base also increases. This causes the current through R3 to decrease, Since the current through R2 unit remain constant then the current through R1 has to increase. This is done with an increase in voltage at node N1. Thus, when the voltage at N2 rises, so does the voltage at node N1. If the voltage at node N2 decreases due to the battery 12 being discharged, then the voltage at Q2 base decreases. This causes an increase in current through R3, thus the current through R1 must decrease. This is accomplished with a decrease in voltage at node N1.

Figure 3 shows a circuit diagram for the deep discharge prevention circuit means 15 (Fig. 1.). As stated above, the function of this circuit is to attach node N2 to supply power to load 10 through means 16 when the voltage at node N2 reaches a preset turn-on level and disconnects node N2 when the voltage level drops to a preset turn-off level. By disconnecting node N2 at a selected voltage level from the load, the battery 12 is prevented from deep discharging. To this end, the deep discharge prevention circuit includes FET device Q5 which is controlled to switch when the voltage at node N2 reaches one of two preset levels.

In the preferred embodiment of this invention, Q5 is a P-channel FET device. Likewise, the device switches to its on state and thus connects the battery to the load when the voltage level at N2 is approximately 12.2 volts. This is called the turn-on voltage. Similarly, the FET device Q5 switches to an off state when the voltage at node N2 drops to 11.4 volts. This is called the turn-off voltage. The turn-on voltage is set by zenner diodes CR1 and R6. Likewise, the turn-off voltage is set by zenner diodes CR2 and R8. The gate electrode of FET device Q5 is connected to the collector electrode of Q4. The emitter electrode of Q4 is connected to ground potential. Also R7 is connected from the base electrode of Q4 to ground. R10 ties the source electrode of Q5 to the gate electrode of Q5.

The bi-polar transistor Q4 and R10 provide hysteresis so that once Q5 begins to turn on, it is forced into its turn-on state. Likewise, when Q5 begins to turn off, it is forced into its off state. It is worthwhile noting that since zenner diodes do not come in 1% steps like resistors, R6 is used is series with CR1 to add the proper voltage from one zenner value to the next. Similarly, R8 is used for the same purpose in series with CR2. Thus, CR1 and R6 are used to control the exact battery voltage at which Q5 turns on. Similarly, CR2 and R8 are used to determine the exact battery voltage at which Q5 turns off. It should be noted that with proper selection of Q5 and the respective voltage setting devices, any load can be switched on/off from a battery or any other DC power source. Also, the switching is done instantaneously due to the latching feature of the circuit. Also, the circuit uses low power, low cost components while having the capability to switch high currents. Also, this circuit does not load the battery when the load is disconnected from it since all active devices are never turned off.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the claims.

Claims

1. An improved power system for providing electrical power to a load characterized in that it comprises :
a first circuit (18) for receiving AC voltage signals from an AC supply main and to generate a rectified DC voltage signal therefrom,
a second circuit (26) responsive to the rectified DC voltage signal and for generating a DC voltage signal whose level is less than the rectified DC voltage signal,
a third circuit (28) for further reducing the voltage levels of the DC voltage signals, and including a series pass device (Q3) with an input terminal coupled to an output node (N1) of the second circuit and another terminal coupled to a node (N2),
a fourth circuit (30) for adjusting the DC voltage at the node (N1) relative to the DC voltage at the output node N2, said fourth circuit causing the series pass device to consumer less energy,
a battery (12) interconnected between the node (N2) and a ground potential, and
a fifth circuit (15) for preventing the battery from deep discharging coupled to said node (N2).

2. The power system of Claim 1 further including a sixth circuit (16) coupled to the fifth circuit (15) for receiving the DC voltage signal from said fifth circuit and reducing said signal to a voltage level which is compatible with said load.

3. The improved power system of Claim 2 further including a conductive means and an attached connector (22) that mates with a receptacle to connect the first circuit (18) to an AC supply main (14).

4. The power system of Claim 1, 2 or 3 wherein the second circuit (26) includes a step down DC-DC converter.

5. The power system of anyone of Claims 1 to 4 wherein the fourth circuit (30) includes a switching device (Q2), a resistor (R3) interconnecting a terminal of said switching device to Node (N1),
a second resistor (R5) interconnecting a control terminal of said switching device to a ground potential, and
a third resistor (R4) coupled to the control terminal and in series with said second resistor, and a diode (46) interconnecting the third resistor to Node (N2).

6. The power system of Claim 5 wherein the switching device (Q2) is a bipolar transistor.

7. The power system of anyone of Claims 1 to 6 wherein the fifth circuit (15) includes an FET device (Q5) having a source terminal coupled to the battery, a drain terminal coupled to the load and a gate terminal,
a first circuit arrangement for setting a turn-on reference voltage level interconnecting the source terminal to a control circuit arrangement (Q4),
a second circuit arrangement for setting a turn-off reference voltage level interconnecting the drain terminal to the control circuit arrangement (Q4), whereby the control circuit arrangement (Q4) is coupled to the gate terminal, said control circuit arrangement being responsive to electrical signals generated from the first circuit arrangement or the second circuit arrangement to cause said FET device to turn on or turn off.

8. In a computer installation having a computer system, a regular power supply for providing regular operating power and a battery (12) for providing auxiliary power, a circuit arrangement for connecting/disconnecting the battery from said computer system characterized in that it comprises :
a switching means (Q5) having three terminals for coupling the battery means to the computer system,
a first threshold means (CR_1,R_6) for setting a turn-on reference voltage interconnecting the first terminal of the switching means to a control means (Q4),
a second threshold means (CR_2,R_8) for setting a turn-off reference voltage interconnecting the second terminal of the switching means to the control means; whereby the control means (Q4) are coupled to the third terminal of the switching means and being operable to monitor the first and the second threshold means and to cause a fast turn-on of said switching means when the turn-on reference voltage level is reached or to cause a fast turn-off of said switching means when the turn-off reference voltage level is reached.

9. The circuit arrangement of Claim 8 wherein said switching means (Q5) is a FET device.

10. The circuit arrangement of Claim 8 or 9 wherein the first and second threshold means include a zenner diode (CR_1, CR_2) connected in series with a resistor (R7).

Patentansprüche

1. Verbessertes Stromversorgungssystem zum Bereitstellen elektrischer Energie für eine Last, dadurch gekennzeichnet, daß es umfaßt:
eine erste Schaltung (18) zum Empfangen von

Wechselspannungssignalen von einem Wechselspannungsnetz und um daraus ein gleichgerichtetes Gleichspannungssignals zu erzeugen; eine zweite Schaltung (26), die auf das gleichgerichtete Gleichspannungssignal reagiert und ein Gleichspannungssignal erzeugt, dessen Pegel niedriger ist, als der des gleichgerichteten Gleichspannungssignals,
eine dritte Schaltung (28) zum weiteren Reduzieren des Spannungspegels des Gleichspannungssignals und ein Durchschalt-Bauelement (Q3) enthaltend, das mit einem Eingangsanschluß an einen Ausgangsknoten (N1) der zweiten Schaltung und mit einem weitere Anschluß an einen Knoten (N2) angeschlossen ist,
eine vierte Schaltung (30) zum Nachstellen der Gleichspannung am Knoten (N1) entsprechend der Gleichspannung am Ausgangsknoten N2, wobei die vierte Schaltung bewirkt, daß in dem Durchschalt-Bauelement weniger Energie umgesetzt wird,
eine Batterie (12), die zwischen den Knoten (N2) und Massepotential geschaltet ist, und
eine fünfte Schaltung (15) zum Schutz der Batterie vor tiefem Entladen, wobei diese Schaltung mit dem Knoten (N2) verbunden ist.

2. Stromversorgungssystem nach Anspruch 1, das ferner eine sechste Schaltung (16) enthält, die an die fünfte Schaltung (15) angeschlossen ist, um das Gleichspannungssignal der fünften Schaltung zu empfangen und dieses Signal auf einen Spannungspegel herabzusetzen, welcher zu der Last kompatibel ist.

3. Verbessertes Stromversorgungssystem nach Anspruch 2, dadurch gekennzeichnet, daß es Leitungsmittel und einen angeschlossenen Steckverbinder (22) umfaßt, der in eine Steckdose gesteckt wird, um die erste Schaltung (18) mit einem Wechselspannungsnetz (14) zu verbinden.

4. Stromversorgungssystem nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß die zweite Schaltung (26) einen Gleichspannungs-Gleichspannungswandler-Abwärtswandler enthält.

5. Stromversorgungssystem nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die vierte Schaltung (30)
ein Schaltelement (Q2) und einen Widerstand (R3), der einen Anschluß des Schaltelementes mit dem Knoten (N1) verbindet,
einen zweiten Widerstand (R5), der einen Steueranschluß des Schaltelementes mit einem Massepotential verbindet, und
einen dritten Widerstand (R4), der an den Steueranschluß angeschlossen und in Reihe zu dem zweiten Widerstand geschaltet ist sowie eine Diode (46) enthält, die den dritten Widerstand mit dem Knoten (N2) verbindet.

6. Stromversorgungssystem nach Anspruch 5, dadurch gekennzeichnet, daß das Schaltelement (Q2) ein Bipolartransistor ist.

7. Stromversorgungssystem nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß die fünfte Schaltung (15) ein FET-Bauelement (Q5) enthält, das einen Sourceanschluß, einen Drainanschluß und einen Gateanschluß besitzt, wobei der Sourceanschluß mit der Batterie verbunden ist und der Drainanschluß mit der Last verbunden ist,
eine erste Schaltungsanordnung, die einen Einschalt-Referenzspannungspegel vorgibt, indem sie den Sourceanschluß mit einem Steuerschaltungselement (Q4) verbindet und
eine zweite Schaltungsanordnung, die einen Ausschalt-Referenzspannungspegel vorgibt, indem sie den Drainanschluß mit dem Steuerschaltungselement (Q4) verbindet, wobei
das Steuerschaltungselement (Q4) mit dem Gateanschluß verbunden ist, und das Steuerschaltungselement auf elektrische Signale reagiert, die von der ersten Schaltungsanordnung oder von der zweiten Schaltungsanordnung erzeugt werden, um zu bewirken, daß das FET-Bauelement einschaltet oder ausschaltet.

8. Schaltungsanordnung innerhalb einer Computerinstallation, die ein Computersystem, ein reguläres Stromversorgungssystem zur Bereitstellung der regulären Betriebsstromversorgung und eine Batterie (12) zur Bereitstellung einer Hilfsstromversorgung enthält, zum Verbinden/Trennen der Batterie vom Computersystem, dadurch gekennzeichnet, daß sie umfaßt:
drei Anschlüsse aufweisende Schaltmittel (Q5) zum Anschließen der Batteriemittel an das Computersystem,
erste Schwellwertmittel (CR1, R6) zum Vorgeben einer Einschalt-Referenzspannung, die den ersten Anschluß der Schaltmittel mit Steuermitteln verbinden,
zweite Schwellwertmittel (CR2, R8) zum Vorgeben einer Ausschalt-Referenzspannung, die den zweiten Anschluß der Schaltmittel mit Steuermitteln verbinden, wobei
die Steuermittel (Q4) mit dem dritten Anschluß der Schaltmittel verbunden sind und so betrieben werden, daß sie die ersten und zweiten Schwellwertmittel überwachen und ein schnelles Einschalten der Schaltmittel bewirken, wenn der Einschalt-Referenzspannungspegel erreicht wird

oder daß sie ein schnelles Ausschalten der Schaltmittel bewirken, wenn der Ausschalt-Referenzspannungspegel erreicht wird.

9. Schaltungsanordnung nach Anspruch 8, dadurch gekennzeichnet, daß das Schaltmittel (Q5) als FET-Bauelement ausgeführt sind.

10. Schaltungsanordnung nach einem der Ansprüche 8 oder 9, dadurch gekennzeichnet, daß die ersten und zweiten Schwellwertmittel Zenerdioden (CR1, CR2) enthalten, die mit einem Widerstand in Reihe geschaltet sind.

Revendications

1. Un système d'alimentation amélioré pour appliquer du courant électrique à une charge, caractérisé en ce qu'il comprend:
   - un premier circuit (18) pour recevoir des signaux de tension de courant alternatif depuis une source d'alimentation de courant alternatif et pour générer un signal de tension de courant continu redressé à partir de ceux ci,
   - un deuxième circuit (26) sensible au signal de tension de courant continu redressé pour générer un signal de tension de courant continu dont le niveau est inférieur au signal de tension de courant continu redressé,
   - un troisième circuit (28) pour réduire encore plus les niveaux de tension des signaux de tension de courant continu, et comprenant un dispositif de passage en série (Q3) avec une borne d'entrée connectée à un noeud de sortie (N1) du second circuit et une autre borne connectée à un noeud (N2),
   - un quatrième circuit (30) pour régler la tension de courant continu au noeud (N1) par rapport à la tension de courant continu au noeud de sortie N2, ledit quatrième circuit provoquant une moindre consommation du dispositif de passage en série,
   - un accumulateur (12) interconnecté entre le noeud (N2) et un potentiel de masse, et
   - un cinquième circuit (15) pour interdire une décharge profonde de l'accumulateur audit noeud (N2).

2. Le système d'alimentation de la revendication 1 comprenant en outre un sixième circuit (16) connecté au cinquième circuit (15) pour recevoir le signal de tension de courant continu depuis ledit cinquième circuit et pour réduire ledit signal à un niveau de tension qui soit compatible avec ladite charge.

3. Le système d'alimentation de courant amélioré de la revendication 2 comprenant en outre un moyen conducteur et un connecteur (22) qui est connecté à une prise pour connecter le premier circuit (18) à une source d'alimentation de courant alternatif (14).

4. Le système d'alimentation de courant de la revendication 1, 2 ou 3 dans lequel le deuxième circuit (26) comprend un convertisseur CC-CC abaisseur.

5. Le système d'alimentation de courant de l'une des revendications 1 à 4 dans lequel le quatrième circuit (30) comprend:

   un dispositif de commutation (Q2),

   une résistance (R3) interconnectant une borne dudit dispositif de commutation au noeud (N1),

   une deuxième résistance (R5) interconnectant une borne de commande dudit dispositif de commutation à un potentiel de masse, et

   une troisième résistance (R4) raccordée à la borne de commande et en série avec ladite deuxième résistance, et une diode (46) interconnectant la troisième résistance au noeud (N2).

6. Le système d'alimentation de la revendication 5 dans lequel le dispositif de communication (Q2) est un transistor bipolaire.

7. Le système d'alimentation de courant de l'une quelconque des revendications 1 à 6 dans lequel le cinquième circuit (15) comprend un dispositif FET (Q5) comprenant une borne de source connectée à l'accumulateur, une borne de drain connectée à la charge et une borne de transfert,

   un premier agencement de circuit pour conditionner un niveau de tension de référence de branchement interconnectant la borne de source à un agencement de circuit de commande (Q4),

   un deuxième agencement de circuit pour conditionner un niveau de tension de référence de coupure interconnectant la borne de drain à l'agencement de circuit de commande (Q4),

   ce qui fait que l'agencement de circuit de commande (Q4) est connecté à la borne de transfert, ledit agencement de circuit de commande étant sensible aux signaux électriques générés par le premier agencement de circuit ou le deuxième agencement de circuit pour provoquer le branchement ou la coupure dudit dispositif FET.

8. Dans une installation d'ordinateur comprenant un système d'ordinateur, une source d'alimentation de courant régulier pour délivrer du courant actif régulier et un accumulateur (12) pour délivrer du

courant auxiliaire, un agencement de circuit pour connecter/déconnecter l'accumulateur dudit système d'ordinateur, caractérisé en ce que ledit agencement de circuit comprend:

un moyen de commutation (Q5) à 3 bornes pour connecter le moyen accumulateur au système d'ordinateur,

un premier moyen de seuil (CR1, R6) pour conditionner une tension de référence de branchement interconnectant la première borne du moyen de commutation à un moyen de commande (Q4),

un second moyen de seuil (CR2, R8) pour conditionner une tension de référence de coupure interconnectant la deuxième borne du moyen de commutation au moyen de commande;

ce qui fait que le moyen de commande (Q4) est connecté à la troisième borne du moyen de commutation et peut être utilisé pour surveiller les premier et second moyens de seuil et pour provoquer un branchement rapide dudit moyen de commutation lorsque le niveau de tension de référence de branchement est atteint ou pour provoquer une coupure rapide dudit moyen de commutation lorsque le niveau de tension de référence de coupure est atteint.

9. L'agencement de circuit de la revendication 8 dans lequel ledit moyen de commutation (Q5) est un dispositif FET.

10. L'agencement de circuit de la revendication 8 ou 9 dans lequel le premier et le second moyens de seuil comprennent une diode Zenner (CR1, CR2) connectée en série à une résistance (R7).

FIG. 1

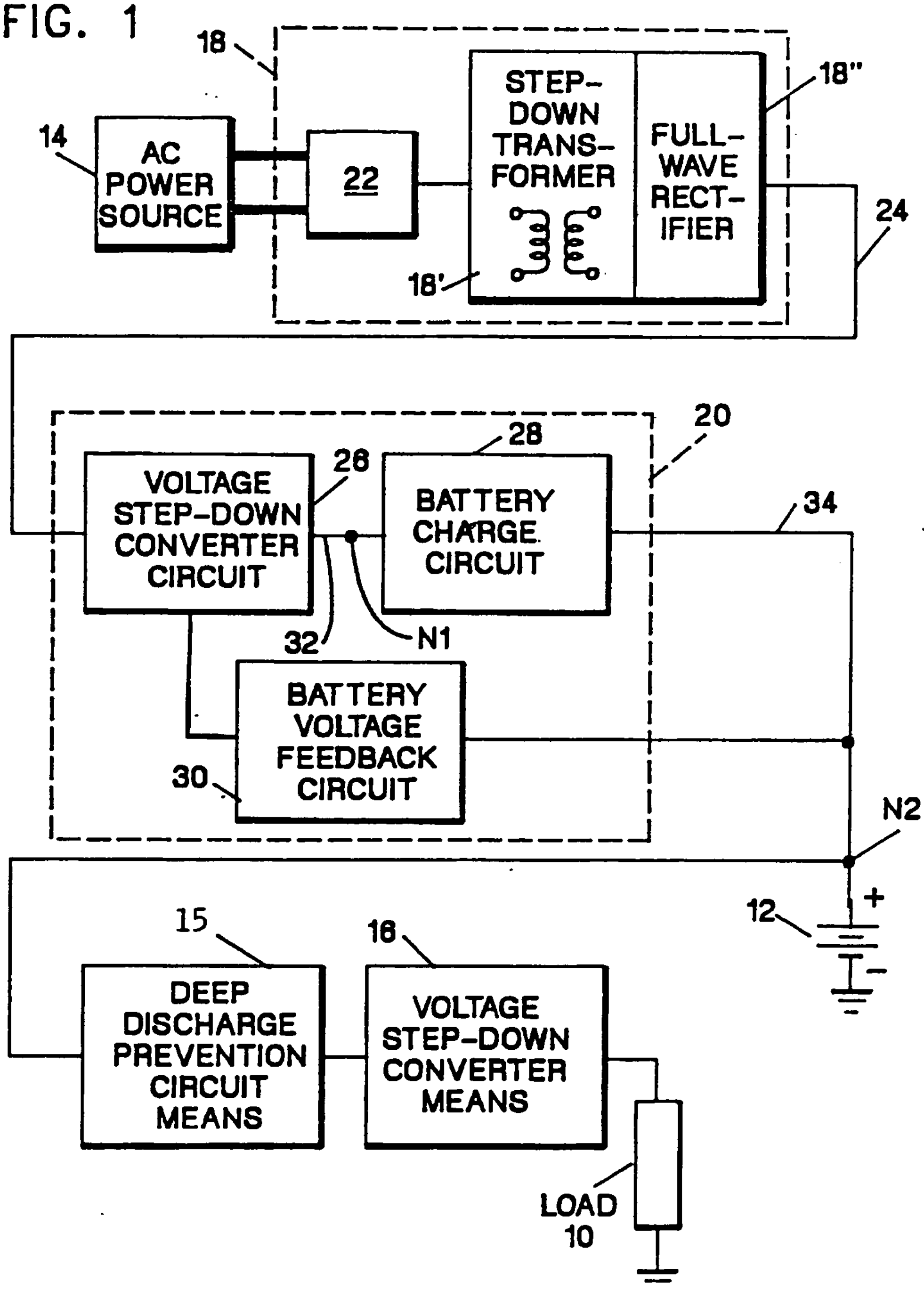
18
18"
14
AC POWER SOURCE
22
STEP-DOWN TRANSFORMER
FULL-WAVE RECTIFIER
18'
24
20
28
26
VOLTAGE STEP-DOWN CONVERTER CIRCUIT
BATTERY CHARGE CIRCUIT
34
32
N1
BATTERY VOLTAGE FEEDBACK CIRCUIT
30
N2
12
+
−
15
16
DEEP DISCHARGE PREVENTION CIRCUIT MEANS
VOLTAGE STEP-DOWN CONVERTER MEANS
LOAD
10

FIG. 2

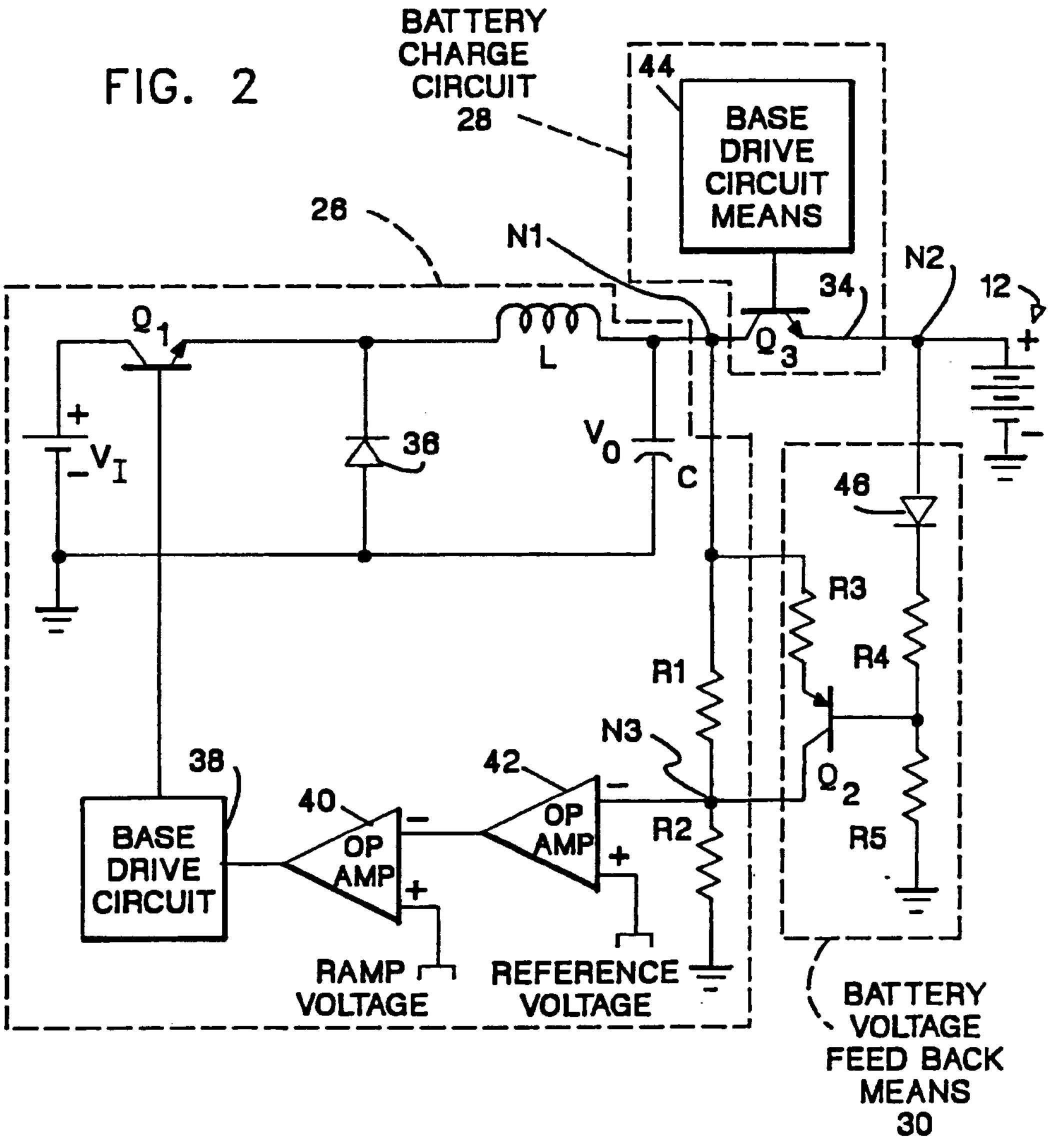
BATTERY
CHARGE
CIRCUIT
28
44
BASE
DRIVE
CIRCUIT
MEANS
26
N1
N2
34
12
Q1
L
Q3
+
-
VI
36
V0
C
46
R3
R4
R1
N3
38
40
42
OP
AMP
R2
R5
Q2
BASE
DRIVE
CIRCUIT
RAMP
VOLTAGE
REFERENCE
VOLTAGE
BATTERY
VOLTAGE
FEED BACK
MEANS
30

FIG. 3